CLAIMS

1. Method of fabricating a mixed substrate wherein:

* two substrates are prepared having respective faces adapted to be bonded together and consisting essentially at these faces of crystalline portions and, on at least one of these two faces, regions formed of a material different from those constituting the crystalline portions,

* these faces are offered up face-to-face and are joined at an interface by molecular bonding to form bulk regions, in which the facing faces are essentially crystalline, and stacked regions, in which at least one of the facing faces essentially consists of a different material, and

* heat treatment is effected to consolidate the bonding,

characterized in that, during the preparation of the substrates (10, 12; 20, 22; 40, 42; 60, 62) or during the joining of the faces, impurity traps are created at said interface (11A, 21A, 41A, 61A) such that any portion of that interface forming part of a bulk region is at most at a given distance from a trap, while the faces are offered up face-to-face with a misalignment between the crystalline portions of these two substrates below a given threshold.

2. Method according to claim 1, characterized in that the regions formed of a different material are electrically insulative layers.

3. Method according to claim 1 or claim 2, characterized in that the regions formed of a different material are localized oxide layers.

4. Method according to any one of claims 1 to 3, characterized in that the traps are localized buried layers.

5. Method according to claim 4, characterized in that the traps are localized oxide layers.

6. Method according to any one of claims 3 to 5, characterized in that these layers have a thickness from approximately 0.01 microns to approximately 3 microns.

7. Method according to any one of claims 3, 5 and 6, characterized in that the localized oxide layers are prepared by thermal oxidation through a mask.

8. Method according to any one of claims 3, 5 and 6, characterized in that the localized oxide layers are prepared by deposition through a mask.

9. Method according to any one of claims 1 to 8, characterized in that preparation includes a step of treating the faces to render them hydrophobic.

10. Method according to claim 9, characterized in that the given misalignment threshold is ± 6° in rotation and ± 1° in bending.

11. Method according to claim 9 or claim 10, characterized in that one of the faces is etched using a mask with patterns that are not farther apart than the given distance, an oxide layer (11, 41) is then generated on this face, the face is planarized to expose the non-etched regions (Z2, Z2") and this face is cleaned to render it hydrophobic.

12. Method according to any one of claims 1 to 8, characterized in that preparation includes a step of treating the faces to render them hydrophilic.

13. Method according to claim 12, characterized in that the given misalignment threshold is ± 1° in rotation and in bending.

14. Method according to claim 12 or claim 13, characterized in that one of the faces with an oxide layer is etched using a mask with patterns that are not farther apart than the given distance, a thermal oxide layer (21, 61) is generated on this face, the face is planarized to

expose the non-etched regions (Z2', Z2''') and this face is cleaned to render it hydrophilic.

15. Method according to any one of claims 1 to 14 characterized in that each crystalline portion is made from a material selected from the group comprising Si, InP, AsGa, Ge, compounds of silicon, silicon-germanium, LiNbO3, III-V compounds, SiC, diamond, sapphire, piezoelectric materials, pyroelectric materials.

16. Method according to any one of claims 1 to 14, characterized in that each crystalline portion is of silicon.

17. Method according to any one of claims 1 to 16, characterized in that the heat treatment lasts a few hours at a temperature from 800°C to 1400°C and the given distance is of the order of one millimeter.

18. Method according to any one of claims 1 to 17, characterized in that the faces adapted to form the interface are treated by deoxidation with HF.

19. Method according to any one of claims 1 to 18, characterized in that the faces adapted to form the interface are heat treated.

20. Method according to any one of claims 1 to 19, characterized in that the faces adapted to form the interface are treated by chemical mechanical polishing.

21. Method according to any one of claims 1 to 20, characterized in that the faces adapted to form the interface are plasma treated.

22. Method according to any one of claims 1 to 21, characterized in that the faces adapted to form the interface are chemically treated.

23. Method according to any one of claims 1 to 22, characterized in that a thinning treatment is applied to one of the substrates.

24. Method according to claim 23, characterized in that one of the substrates is thinned by a chemical

mechanical abrasion treatment.

25. Method according to claim 23, characterized in that one of the substrates is prepared so that it is demountable and a subsequent step consists in demounting this substrate.

26. Method according to claim 23, characterized in that one of the substrates is thinned by producing a fragile layer (22A) and by fracturing this fragile layer.

27. Method according to any one of claims 1 to 26, characterized in that the crystalline portions of the two substrates are prepared from the same crystal.

28. Method according to claim 27, characterized in that the two substrates are prepared by producing a fragile layer (30A, 50A) in the same source crystal (30, 50), placing markers (32, 52) on either side of this fragile layer and causing a fracture in this fragile layer to create two free faces, and the interface with the stacked regions and the traps is made by bringing these faces into contact after lining up said markers.

29. Method according to claim 28, characterized in that this fragile layer (30A, 50A) is formed by ionic implantation.

30. Method according to claim 29, characterized in that this fragile layer is formed by implanting hydrogen ions.

31. Method according to any one of claims 28 to 30, characterized in that the markers are formed within the thickness of the source crystal and on either side of the fragile layer.

32. Structure including two substrates including an interface obtained by molecular bonding of two faces, these substrates including crystalline portions having on either side of the interface a misalignment less than ± 6° in rotation and less than ± 1° in bending and including at this interface stacked regions, including at least one

localized region essentially consisting of a material different from those constituting the crystalline portions, and where applicable impurity traps such that any portion of the interface away from the stacked regions is at most at a given distance from a stacked region or a trap.

33. Structure according to claim 32, characterized in that the given distance is of the order of one millimeter.

34. Structure according to claim 32 or claim 33, characterized in that the crystals are of silicon.

35. Structure according to any one of claims 32 to 34, characterized in that the traps are localized buried layers.

36. Structure according to claim 35, characterized in that the traps are localized oxide layers.

37. Structure according to any one of claims 32 to 36, characterized in that the regions essentially consisting of a different material are electrically insulative regions.

38. Structure according to any one of claims 32 to 37, characterized in that the regions essentially consisting of a different material are localized oxide layers.